CISC-471 WINTER 2015

HOMEWORK 6

Please work on these problems and be prepared to share your solutions with classmates in class on Monday February 23 (after reading week). **NOTE** To provide an incentive for you to do this work you may submit it to me either hard copy or electronically either in class on February 23, or electronically before class on February 23. Your work will not be marked nor will it be returned. However, I will keep it, and use it to possibly raise your grade when it comes time to submit the final grades, For example if you do poorly on the final and have consistently handed in homework I may raise your grade.

Programming

For each of the questions below write a short program to assist you in obtaining a solution. Also provide an estimate of the time and space complexity of your algorithm.

Problems

These questions come from *An Introduction to Bioinformatics Algorithms* by Neil C. Jones and Pavel A. Pevzner.

Problem 6.4: Modify DPCHANGE to return not only the smallest number of coins but also the correct combination of coins.

Problem 6.6: Find the number of different paths from source (n, m) to sink (0, 0) in an $n \times m$ rectangular grid. These paths are described in section 6.3 The Manhattan Tourist Problem. A valid path can only go up or left (no diagonal moves). Write a dynamic programming algorithm to determine this quantity. You can also obtain the result by thinking of a valid path as a string of length $n+m$ using n 'U's and m 'L's. BONUS: Now also allow diagonal moves (up and left). Update your program to handle this additional move. The combinatorial solution now must deal with this additional move in a non-trivial way.

Problem 6.18: What is the optimal global alignment for MOAT and BOAST? Show all optimal alignments and the corresponding paths under the scoring matrix below

and indel penalty -1.

0	A	B	M	O	S	T
A	1	-1	-1	-2	-2	-3
B	-1	1	-1	-1	-2	-2
M	-1	-1	2	-1	-1	-2
O	-2	-1	-1	1	-1	-1
S	-2	-2	-1	-1	1	-1
T	-3	-2	-2	-1	-1	2